REMARKS/ARGUMENTS

The above-identified patent application has been reviewed in light of the Examiner's Action dated October 7, 2005. Claims 1, 4, 11, 20, 24, 26, 35, 36, 38, 47, 57, 58, 68 and 76 have been amended, and claims 59 and 75 have been canceled, without intending to abandon or to dedicate to the public any patentable subject matter. Accordingly, Claims 1-24, 26-58, 60-74 and 76-89 are now pending. As set forth more fully below, reconsideration and withdrawal of the rejections of the claims are respectfully requested.

Initially, applicants would like to thank the Examiner for the courtesies extended during the telephone interview that was held on October 27, 2005. During that interview, the disclosures of the cited references and potential amendments to the claims were discussed. No agreement regarding allowable subject matter was reached during the interview.

The present invention is generally directed to the reception of communication signals transmitted using optical wavelengths through free space. More particularly, embodiments of the present invention are directed to demultiplexing and detecting multiple signals transmitted as part of a beam. This is accomplished by using a first optical element (for example, a holographic element) to separate or demultiplex individual signals from one another, and direct those signals to individual detectors. Each of the detectors may be associated with a second optical element. In addition, embodiments of the claimed invention may include a phase retarder and/or a reflective surface for folding received signals back towards detectors.

The Claims stand rejected under 35 USC §103 as being unpatentable over U.S. Patent No. 5,757,523 to Wood et al. ("Wood") in view of U.S. Patent No. 5,255,065 to Schwemmer

("Schwemmer"). In order to establish a prima facie case of obviousness under §103, there must be some suggestion or motivation to modify the reference or to combine the reference teachings, there must be a reasonable expectation of success, and the prior art reference or references must teach or suggest all of the claim limitations. (MPEP §2143.) Because the cited references, whether considered alone or in combination, do not teach, suggest or describe a method for receiving signals or an apparatus for receiving signals as claimed, the rejections of the claims as obvious should be reconsidered and withdrawn.

The Wood reference is generally directed to a method, device, or system used to illuminate a remote target area by passing radiation, containing multiple wavelengths 10, through a diffractive hologram 12. The purpose of the hologram 12 is to diffract the radiation such that a divergent pattern exists which can be used to cover a remote target area. Depending on the target area, a hologram 12 is selected to diffract the radiation such that it covers the area with as little radiation as possible being wasted outside the target area. Fitting the radiation to the selected target area increases the efficiency of the system. Wood does mention that the hologram or diffraction grating could be used to separate into different detectors light at several different wavelengths all emitted from the same cell or spatial location. (Wood, col. 5, ln. 67 to col. 6, ln. 2) However, Wood does not offer any more details as to how a such a system would operate or be comprised. For example, Wood does not describe a receiver that incorporates a phase retarder, reflectors, a focusing element in addition to an element for separating separate wavelengths associated with each of a number of detectors, a first optical element that subtends a certain minimum amount of a beam having a minimum divergence angle, or a received beam that

has a diameter that is less than an inner scale of the atmosphere in the vicinity of the source transmitter.

The Schwemmer reference is generally directed to a conically scanned holographic lidar telescope. More particularly, Schwemmer discusses transmitting an outgoing laser beam that is collimated by and diffracted off the center of a holographic optical element, to be transmitted coaxially along the receiver's field of view. (Schwemmer, Col. 3, line 38-40.) Laser light back-scattered by the Earth's atmosphere acts as a reconstruction beam that is conjugate to the original reference beam. (Schwemmer, Col. 2, lines 65-68.) A holographic optical element diffracts most of the desired laser radiation into a converging beam that is the conjugate of the original object beam, and is brought to a focus on a detector. (Schwemmer, Col. 2, line 68 to Col. 3, line 3.) Schwemmer also discusses a multiple wavelength system in which the different wavelengths are separated along a common optical axes. (Schwemmer, Col. 3, line 66 to Col. 4, line 3.) However, Schwemmer does not teach, suggest or disclose focusing elements associated with separate detectors forming a spot size that is smaller than a first focusing element, the use of a phase retarder, a first optical element that subtends a certain minimum amount of a beam having a minimum divergence angle, or a received beam that has a diameter that is less than an inner scale of the atmosphere in the vicinity of the source transmitter. In addition, Schwemmer is not directed to transmitting information-bearing signals. Instead, Schwemmer is concerned with transmitting a non-information-bearing signal from a first location, and receiving a version of that signal that has been reflected off of a volume in the atmosphere in order to obtain information regarding that volume in the atmosphere.

With the above general description of the claimed invention and the cited references, it can be appreciated that at least the italicized features of the independent claims are not taught, suggested or described by the cited references:

1. A method for receiving high frequency signals transmitted through free space, comprising:

passing one or more optical signals, the one or more optical signals containing data and being composed of radiation of a plurality of differing wavelengths, through a diffractive optical element to form a plurality of signal segments, each signal segment having a different mean wavelength;

passing a portion of each of said one or more optical signals through a phase retarder, and

detecting data in each of said plurality of signal segments at or near a different spatial focal point.

11. A method for receiving high frequency signals transmitted through free space, comprising:

dividing an optical signal, the optical signal containing data and being composed of radiation of a plurality of differing wavelengths, into a plurality of signal segments, each signal segment having a different mean wavelength;

reflecting said divided signals towards a plurality of spaced apart detectors; and

detecting, with said plurality of spaced apart detectors data in each of said plurality of signal segments, wherein each of said spaced apart detectors is located substantially at a different focal point, the focal points being at different positions along a common optical axis.

24. An apparatus for receiving an optical signal transmitted through free space, the optical signal being composed of radiation of a plurality of wavelengths, comprising:

at least one diffractive optical element for focusing radiation of different wavelengths at different corresponding focal points, wherein said focal points are at different positions along the optical axis of said optical element, *wherein said at least one diffractive optical element has a diameter that is greater than a Fresnel scale for said plurality of wavelengths and a distance from a transmitter, and wherein said focal points encompass a first area comprising a first spot size or greater*;

and

a plurality of detectors, each detector being located at or near a different one of the focal points and receiving the radiation focused on the focal point corresponding to the detector, *wherein each of the plurality of detectors has a photoactive area equal to a second area that is less than said first area, wherein each of said plurality of detectors is associated with a focusing element that reduces the spot size of incident radiation to no more than said second area.*

35. An apparatus for receiving an optical signal transmitted through free space, the optical signal containing data, comprising:

a first holographic element for focusing radiation including a number of different wavelengths, wherein each wavelength is focused to a different point;

a number of detectors; and

a number of second lenses, wherein one of said second lenses is located between the first lens and an associated detector, the second lens reducing a spot size of the focused radiation after passing through the second lens.

47. A method for receiving high frequency signals transmitted through free space, comprising:

first passing an optical signal, the optical signal containing data, through a first lens provided as part of a receiver to form focused radiation having a first mean wavelength, *wherein said first lens subtends at least about 50 microradians of a beam comprising the optical signal, and wherein at the receiver the optical signal has an angle of divergence of at least 20 microradians*;

second passing the focused radiation through a second lens to form converging radiation having a second mean wavelength, the first mean wavelength being different than the second mean wavelength; and

detecting data in the convergent radiation.

57. An apparatus for receiving an optical signal, the optical signal containing data, comprising:

a first optical element for focusing a set of different optical wavelengths in the optical signal at different locations along a first optical axis of said first optical element;

a reflective surface for reflecting the focused set of different optical signals and forming a reflected set of different optical signals; and

a number of detectors, wherein a detector is positioned to receive each of the reflected optical signals, the detectors being located along the first optical axis.

68. A method for receiving an optical signal transmitted through free space, comprising:

first passing the optical signal, the optical signal containing data, through a first lens to form a plurality of signal segments, each corresponding to a different median wavelength, wherein the first lens is a diffractive optical element;

reflecting the plurality of signal segments off a reflective surface to form reflected radiation; and

detecting data in the reflected radiation at or near an optical focal point for each of the signal segments,

wherein the optical signal has a beam size that is less than a size of an inner scale in the vicinity of the source transmitter.

77. (Original) A method of manufacturing a detector assembly, comprising:

forming an optical detector on an at least substantially transparent substrate, the optical detector being on a first side of the substrate; and

forming, on an opposed second side of the substrate, a lens, the lens having a refractive index such that a median wavelength of radiation passing through the lens is reduced.

Applicant notes that Claim 77 and dependent Claims 78-89 are not directly addressed by the Detailed Action. However, neither Wood nor Schwemmer discusses a method of forming a detector assembly in which an optical detector is formed on one side of a substrate and on which a lens is formed on the other side of the substrate by Claims 77-89.

The cited references do not teach, suggest or disclose each and every element of the pending claims. Accordingly, for at least the reasons set forth herein, the rejections of the claims as obvious should be reconsidered and withdrawn.

Application No. 10/053,679

The application now appearing to be in form for allowance, early notification of same is respectfully requested. The Examiner is invited to contact the undersigned by telephone if doing so would expedite the resolution of this case.

Respectfully submitted,

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